Computer Science

DESIGN AND IMPLEMENTATION OF RELIABLE DATA SYSTEMS

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The Arctic and Antarctic Circles are regions of particular interest to those who study changes in the magnetosphere. The area is exceptionally sensitive to variations caused by solar winds striking the Earth's magnetic field. Results of this research will help further understanding of the magnetosphere. This makes the measurement of magnetic field data in the region especially important. However, due to the Arctic's remote location and lack of regularly staffed research stations, automated systems are necessary to take measurements for later analysis. Our task was to build replacement systems for old and malfunctioning machines sent to observation stations over a decade ago.

Our new systems are designed to automatically log magnetic field data and run without human interaction for periods up to one month. The machines log the information from Search Coil Magnetometers, which are basically instruments made of tightly-wound metal coils which detect a strong, easily measurable, magnetic field. The instruments feed the data to our systems via serial communication, which we timemark with Global Positioning System (GPS) technology and store on disk for later archival on compact disks.

Each system utilizes a highly-configurable software interface running on commercially available PCs. The application, written in C++ with some 2500 lines of code, performs logging, archival and some data analysis.